

WHAT IS CLAIMED IS:

1 1. In a microprocessor that manages interlock conditions for load instructions and
2 that supports speculative and out-of-order execution of load instructions, a method of bypassing
3 data to younger instructions, comprising:

4 identifying a source register upon whose contents a current instruction depends for
5 execution;

6 providing a load annex, the load annex having a plurality of sequential load entries, each
7 of the plurality of sequential load entries being capable of storing data associated
8 with the source register, wherein each load entry is associated with one of a
9 plurality of sequential priority levels, the plurality of sequential priority levels
10 comprising a highest priority level and a lowest priority level;

11 storing, in the sequential entries of the load annex, a plurality of load data associated with
12 a particular register, wherein the plurality of load data associated with a particular
13 register are stored in program order with respect to each other;

14 providing a non-load annex, the non-load annex having a plurality of non-load entries,
15 each of the plurality of non-load entries being capable of storing data associated
16 with the source register, wherein each entry of the non-load annex is associated
17 with one of the plurality of sequential priority levels;

18 providing that, at most, only one among the load entry associated with a particular
19 priority level and the non-load entry associated with the particular priority level
20 contains a value associated with the source register;

21 locating, among the plurality of load annex entries and the plurality of non-load annex
22 entries, a freshest value associated with the source register; and

23 providing the freshest value for use in execution of the current instruction.

1 2. The method recited in Claim 1, wherein locating a freshest value further includes:
2 determining whether any annex entry associated with the highest priority level contains a
3 value associated with the source register, and, if so, selecting the value in the
4 annex entry associated with the highest priority level as the freshest value; and

determining, if no annex entry is associated with the highest priority level, whether any annex entry associated with the lowest priority level contains a value associated with the source register, and, if so, selecting the value in the annex entry associated with the lowest priority level as the freshest value.

3. The method recited in Claim 1, wherein:

the plurality of priority levels includes at least one intervening level between the highest priority level and the lowest priority level.

4. The method recited in Claim 3, wherein locating a freshest value further includes:

determining whether an annex entry associated with the highest priority level contains a value associated with the source register, and, if so, selecting the value in the entry associated with the highest priority level as the freshest value;

if not, sequentially determining whether an annex entry associated with successively lower priority levels lower than the highest priority level contains a value associated with the source register, selecting as the freshest value the value associated with the source register from the annex entry with the highest of the lower priority levels.

5. The method recited in Claim 1, further comprising:

providing a plurality of non-load annexes.

6. A computer system that bypasses load data to younger instructions, comprising:
a main memory;

at least one processing unit coupled to the main memory, the processing unit being configured to execute load instructions and also being configured to execute a current instruction having a source register;

a load annex, the load annex having a plurality of sequential load entries, each of the plurality of sequential load entries being capable of storing data associated with the source register, wherein each load entry is associated with one of a plurality of sequential priority levels, the plurality of sequential priority levels comprising a highest priority level and a lowest priority level;

11 a scoreboard that manages interlock conditions for the load instructions executed by the
 12 processing unit, wherein the scoreboard further comprises a module that permits
 13 execution of a plurality of load instructions having the same destination register,
 14 wherein the plurality of load instructions having the same destination register are
 15 executed in program order with respect to each other;

16 a non-load annex, the non-load annex having a plurality of non-load entries, each of the
 17 plurality of non-load entries being capable of storing data associated with the
 18 source register, wherein each entry of the non-load annex is associated with one
 19 of the plurality of sequential priority levels;

20 a module, coupled to the main memory, that provides for locating, among the plurality of
 21 load annex entries and the plurality of non-load annex entries, a freshest value
 22 associated with the source register; and

23 a module that is operable to provide the freshest value for use in execution of the current
 24 instruction.

1 7. The computer system recited in Claim 6, wherein:

2 the module the provides for locating a freshest value further includes:

3 a module that is operable to determine whether any annex entry associated with
 4 the highest priority level contains a value associated with the source
 5 register, and, if so, is further operable to select the value in the annex entry
 6 associated with the highest priority level as the freshest value; and

7 a module that is operable to determine, if no annex entry is associated with the
 8 highest priority level, whether any annex entry associated with the lowest
 9 priority level contains a value associated with the source register, and, if
 10 so, is further operable to select the value in the annex entry associated with
 11 the lowest priority level as the freshest value.

1 8. The computer system recited in Claim 6, wherein:

2 the plurality of priority levels includes at least one intervening level between the highest
 3 priority level and the lowest priority level.

1 9. The computer system recited in Claim 8, wherein:

2 the module the provides for locating a freshest value further includes:

3 a module that is operable to determine whether an annex entry associated with the
4 highest priority level contains a value associated with the source register,
5 and, if so, is further operable to select the value in the annex entry
6 associated with the highest priority level as the freshest value; and

7 a module that is operable, if no annex entry associated with the highest priority
8 level contains a value associated with the source register, to sequentially
9 determine whether an annex entry associated with successively lower
10 priority levels contains a value associated with the source register, and, if
11 an entry at one or more priority levels lower than the highest priority level
12 contains a value associated with the source register, is operable to select as
13 the freshest value the value associated with the source register from the
14 annex entry with the highest of the lower priority levels.

1 10. The computer system recited in Claim 6, further comprising:

2 a plurality of non-load annexes, each of the plurality of non-load annexes having a
3 plurality of non-load entries, each of the plurality of non-load entries being
4 capable of storing data associated with the source register, wherein each entry of
5 each non-load annex is associated with one of the plurality of sequential priority
6 levels.

1 11. A computer system, comprising:

2 a main memory;

3 at least one processing unit coupled to the main memory, the processing unit being
4 configured to execute load instructions and also being configured to execute a
5 current instruction having a source register;

6 means for identifying a source register upon whose contents a current instruction depends
7 for execution;

means for storing a plurality of load data associated with the source register, wherein each load data is associated with one of a plurality of sequential priority levels, the plurality of sequential priority levels comprising a highest priority level and a lowest priority level;

means for storing a plurality of load data associated with a particular register in program order with respect to each other;

means for storing a plurality of non-load data associated with the source register, wherein each non-load data is associated with one of the plurality of sequential priority levels;

means for providing that, at most, only one among the load data associated with a particular priority level and the non-load data associated with the particular priority level contains a value associated with the source register;

means for locating, among the plurality of load data and the plurality of non-load data, a freshest value associated with the source register; and

means for providing the freshest value for use in execution of the current instruction.

12. The computer system recited in Claim 11, wherein means for locating a freshest value further comprises:

means for identifying whether any load data or non-load data associated with the highest priority level contains a value associated with the source register, and, if so, selecting the identified data as the freshest value; and

means for identifying, if no annex entry is associated with the highest priority level, whether any load data or non-load data associated with the lowest priority level contains a value associated with the source register, and, if so, selecting the identified data as the freshest value.

13. The computer system recited in Claim 11, wherein:

the plurality of priority levels includes at least one intervening level between the highest priority level and the lowest priority level.

1 14. The computer system recited in Claim 13, wherein means for locating a freshest
2 value further includes:

3 means for identifying whether a load data or non-load data associated with the highest
4 priority level contains a value associated with the source register, and, if so,
5 selecting the identified data as the freshest value;

6 means for, if no load data or non-load data associated with the highest priority level
7 contains a value associated with the source register, sequentially identifying
8 whether a load data or non-load data associated with successively lower priority
9 levels contains a value associated with the source register, and, if an entry at one
10 or more priority levels lower than the highest priority level contains data
11 associated with the source register, selecting as the freshest value the identified
12 data associated with the highest among the lower priority levels.

1 15. The computer system recited in Claim 11, further comprising:

2 providing a plurality of means for storing a plurality of non-load data associated with the
3 source register, wherein each non-load data is associated with one of the plurality
4 of sequential priority levels.